

Memorandum

To: MR. MAJID MADANI
Division of Structure Design
Office of Bridge Design C, Branch 14

Attention: G. Murugesh

Date: August 17, 2000

File: 04-Sol, CC-680-0.0/25.0
04-006031
Benicia-Martinez Br. and OH
Bridge No. 28-0153R
Access Trestle

From: **DEPARTMENT OF TRANSPORTATION**
ENGINEERING SERVICE CENTER
Division of Structural Foundations - MS 5
Office of Structure Foundations

Subject: Access Trestle Foundation Recommendations

This report was initiated by your request (memo dated August 7, 2000) for foundation recommendations for the access trestle to accommodate marine approaches for the New Benicia-Martinez Bridge.

The access trestle will be constructed from the south shore to the Pier 6 and from the north shore to the Pier 16.

Geologic Data

Information concerning the foundation material at the trestle site was obtained from borings made by Caltrans in 1993, 1997, 1998, and 1999 along the proposed new bridge alignment. Additional data were obtained from a Site Investigation Report for the Stauffer Chemical Company and Rhone-Poulenc Basic Chemicals Co. performed by MG Engineers and Geologists, Inc. Caltrans geologic data are presented on the Log of Test Borings dated 08-18-2000. Consultants monitoring well's logs are available for review in this Office.

The site is underlain by fresh to decomposed and fractured claystone, siltstone, sandstone, and shale from Panoche and Martinez Formations. Depth to the bedrock is variable, and ranges from elevation -33.0 m to elevation -39.0 m on the north shore and -24.0 m to -11.0 m on the south shore. Bedrock on the north shore is covered by up to 34 m of soft to very loose deposits of silty clay and clayey silt with some sand and gravel lenses. On the south side bedrock is covered by soft to very loose silty clay and silt deposits up to 24.0 m thick. More sand and gravel lenses with variable density may be encounter at the south shore trestle.

Elevation of the water level will vary with the tide.

Channel profile is based on the November 1997 Bathymetry Contours provided by Fugro-West, Inc. Mudline contours should be included in foundation plans.

Foundation Data

The south and north shore Access Trestles as it is presented on Access Trestle Layout Plans No. 1, 2 and 3 (dated August 2, 2000) can be supported on open ended 760 mm and 600 mm diameter, battered and vertical steel pipe piles driven to bedrock.

Table 1
Foundation Data

Location	Pile Type	Design Loading (kN)	Nominal Resistance (kN)		Estimated Pile Tip Elevation (m)
			Compr.	Tension	
South Shore Access Trestle Station 39+03-40+48 BM line w/up to 30 m offset to the right (TB-Trestle Bent) TB-1;TB-2;TB-3;TB-4	PP 762X16 PP 610X16 with 3:1 batter PP 762X16 with 3:1 batter	1750 1200 1650	3500 2400 3300	0	-24.0
TB-5;TB-6	PP 762X16 PP 610X16 with 3:1 batter PP 762X16 with 3:1 batter	1750 1200 1650	3500 2400 3300	0	-23.0
TB-7;TB-8	PP 762X16 PP 610X16 with 3:1 batter PP 762X16 with 3:1 batter	1750 1200 1650	3500 2400 3300	0	-22.0
TB-9;TB-10	PP 762X16 PP 610X16 with 3:1 batter PP 762X16 with 3:1 batter	1750 1200 1650	3500 2400 3300	0	-21.0
TB-11;TB-12	PP 762X16 PP 610X16 with 3:1 batter PP 762X16 with 3:1 batter	1750 1200 1650	3500 2400 3300	0	-20.0
TB-13	PP 762X16 PP 610X16 with 3:1 batter PP 762X16 with 3:1 batter	1750 1200 1650	3500 2400 3300	0	-19.0
TB-14	PP 762X16 PP 610X16 with 3:1 batter PP 762X16 with 3:1 batter	1750 1200 1650	3500 2400 3300	0	-18.0
TB-15	PP 762X16 PP 610X16 with 3:1 batter PP 762X16 with 3:1 batter	1750 1200 1650	3500 2400 3300	0	-17.0
TB-16	PP 762X16 PP 610X16 with 3:1 batter PP 762X16 with 3:1 batter	1750 1200 1650	3500 2400 3300	0	-16.0
TB-17	PP 762X16 PP 610X16 with 3:1 batter PP 762X16 with 3:1 batter	1750 1200 1650	3500 2400 3300	0	-16.0
TB-18	PP 762X16 PP 610X16 with 3:1 batter PP 762X16 with 3:1 batter	1750 1200 1650	3500 2400 3300	0	-15.0
TB-19	PP 762X16 PP 610X16 with 3:1 batter PP 762X16 with 3:1 batter	1750 1200 1650	3500 2400 3300	0	-14.0
TB-20	PP 762X16 PP 610X16 with 3:1 batter PP 762X16 with 3:1 batter	1750 1200 1650	3500 2400 3300	0	-13.0
TB-21	PP 762X16 PP 610X16 with 3:1 batter PP 762X16 with 3:1 batter	1750 1200 1650	3500 2400 3300	0	-12.0
TB-22	PP 762X16 PP 610X16 with 3:1 batter PP 762X16 with 3:1 batter	1750 1200 1650	3500 2400 3300	0	-11.0

North Shore Access Trestle	PP 762X16	1750	3500	0	-35.0
	PP 610X16 with 3:1 batter	1200	2400		-35.0
Station 21+80-24+15 NB-Line TB-1;TB-2;TB-3	PP 762X16 with 3:1 batter	1650	3300		-35.0
TB-4; TB-5;TB-6;TB-7;TB-8	PP 762X16	1750	3500	0	-36.0
	PP 610X16 with 3:1 batter	1200	2400		-36.0
	PP 762X16 with 3:1 batter	1650	3300		-36.0
TB-9;TB-10;TB-11;TB-12; TB- 13;TB-14;TB-15;TB-16;TB- 18;TB-19; TB-20; TB-21; TB-22; TB-23; TB-24 TB-25; TB-26	PP 762X16	1750	3500	0	-37.0
	PP 610X16 with 3:1 batter	1200	2400		-37.0
	PP 762X16 with 3:1 batter	1650	3300		-37.0
TB-27;TB-28; TB-29; TB-30; TB-31;TB-32;TB-33;TB-34; TB-35; TB-36;	PP 762X16	1750	3500	0	-38.0
	PP 610X16 with 3:1 batter	1200	2400		-38.0
	PP 762X16 with 3:1 batter	1650	3300		-38.0
TB-37;TB-38; TB-39; TB-40; TB-41; TB-42;	PP 762X16	1750	3500	0	-39.0
	PP 610X16 with 3:1 batter	1200	2400		-39.0
	PP 762X16 with 3:1 batter	1650	3300		-39.0

A pile attaining 100 percent of the design load requirements (using ENR formula), before the estimated tip is reached, should be considered acceptable.

Piles which not have the required bearing capacity shall be extended or redriven following a set period as determined by the Engineer.

Piles tip is controlled by compression.

This Office did not calculate lateral forces.

Top of bedrock elevations for the south shore access trestle were estimated from a straight line projection between borehole 97-1 and boreholes drilled on Rhone-Poulenc property (11C and 46). The actual top of rock elevation may vary from the estimated.

Top of bedrock elevations on the north shore were estimated from boreholes drilled to the west of the proposed access trestle. The actual top of rock elevation may vary from the estimated depths presented in the Table.

Soil and rock strengths are expected to vary within proposed construction areas. Pipe piles may penetrate approximately 1.5 m into the intensely weathered to decomposed upper portion of the bedrock.

Piles will be removed after completion of the construction. It is estimated that during pile removal it will be necessary to overcome skin friction of a minimum 880 kN.

Vibratory hammer should be used for pile extraction.

Construction considerations:

- 1) Difficult pile installation is anticipated due to presence of soft bay mud overlying dense soil, cobbles and boulders, tidal fluctuation, high water level, subsurface concrete debris and buried logs, underground utilities and the requirement of pile embedment into rock.
- 2) Vibration and oscillation is not allowed as a piles placement method.
- 3) Impact hammers must be approved by the Engineer. Impact hammers shall be steam, air, diesel or drop hammers. At some locations steel pipes will be sinking under their own weight. Pipe piles should have reinforced driving tips.
- 4) The PDA test is recommended to monitor pile driving at selected locations or on the first location where piles will be driven. The PDA monitoring should help to prevent piles from being overstressed during driving.
- 5) Prior to pile installation, the Contractor shall provide a driving system submittal, including drivability analysis. The driving system submittal shall contain an analysis showing that the proposed driving systems will install the piles to the bedrock elevation.
- 6) The access trestle is expected to be removed after 3 years in service.
- 7) Central relief drilling may be necessary during pile removal.

If you have any questions regarding presented recommendations, please call at (916) 227-7047.

BOGDAN KOMORNICZAK CEG 2094

Associate Engineering Geologist

c: RFox - OSF
ELeivas - OSF
EDavisson - ESC
EWiecha-Dist. 4